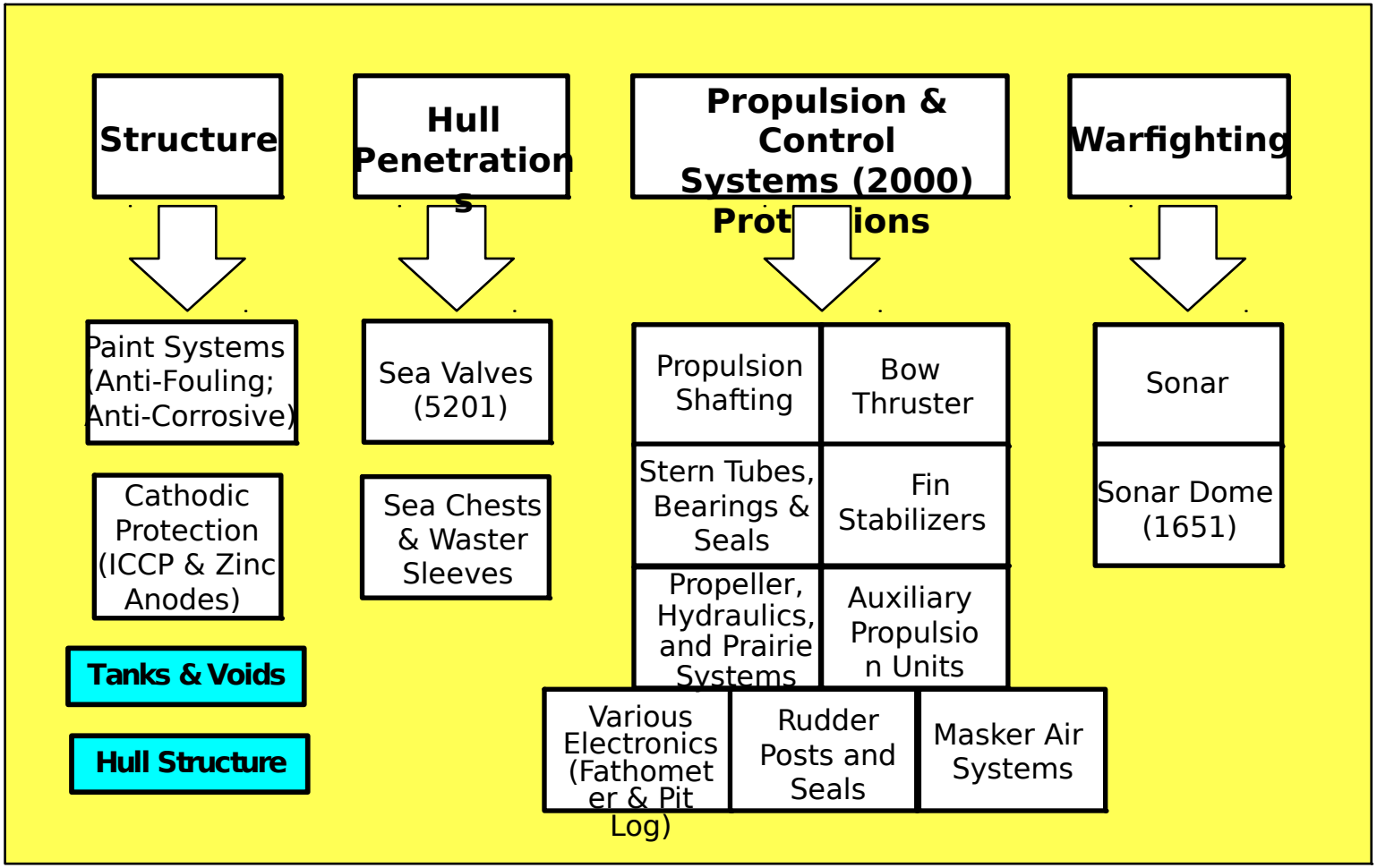
U/W HULL SYSTEM MAINTENANCE STRATEGY

CONDITION-BASED DRYDOCKING

Type Desk Officer Training
August 2002

“Underwater Hull System”…

REPRESENTATIVE NAVSURFLANT SHIP



Condition Based Drydocking

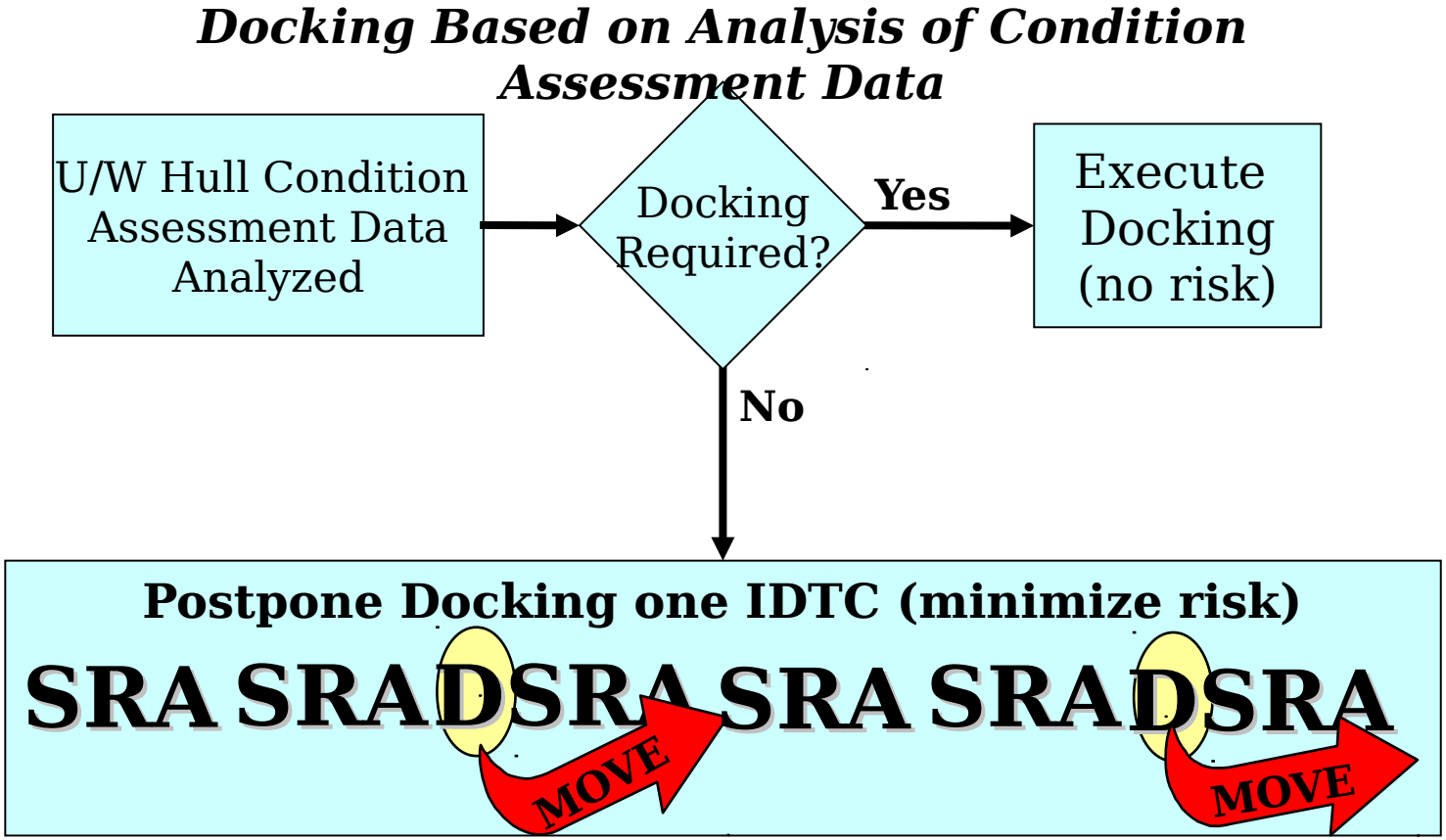
Goal:

- Establish and extend Mean Time Between Maintenance
- Reduce Life Cycle Maintenance Costs
- Increased Operational Availability
- No Loss In System Reliability
- Bonus Benefits
  - Shorter Maintenance periods => Less reduction in crew proficiency
  - Improved QOS

Condition-Based Drydocking Strategy

- **Strategy:**
  - Defer Docking Unless Conditions Warrant Docking
- **Procedure:**
  - Assess Ship Underwater Hull Condition
  - Document Results
  - Use Material History Data And Cost Data To Decide

What is Condition Based Dry-Docking?



Condition-Based Drydocking Strategy

- **Maintenance History (Since Last Docking)**
- **Condition Assessment**
  - SEMAT
    - Sea Valve Assessment
    - ICCP Assessment
    - Tanks
    - Hull Structure
  - Expanded U/W Hull Assessment
    - Visual
    - U/W Hull Paint Dry Film Thickness (DFTs)
    - Waterborne Bearing Clearances (AER if req'd)
- **Existing CSMP Tasks**
  - Rudder
  - Ballast Valves
  - NAVSEA/TYCOM Alts/Others

PUTTING THE PUZZLE TOGETHER:

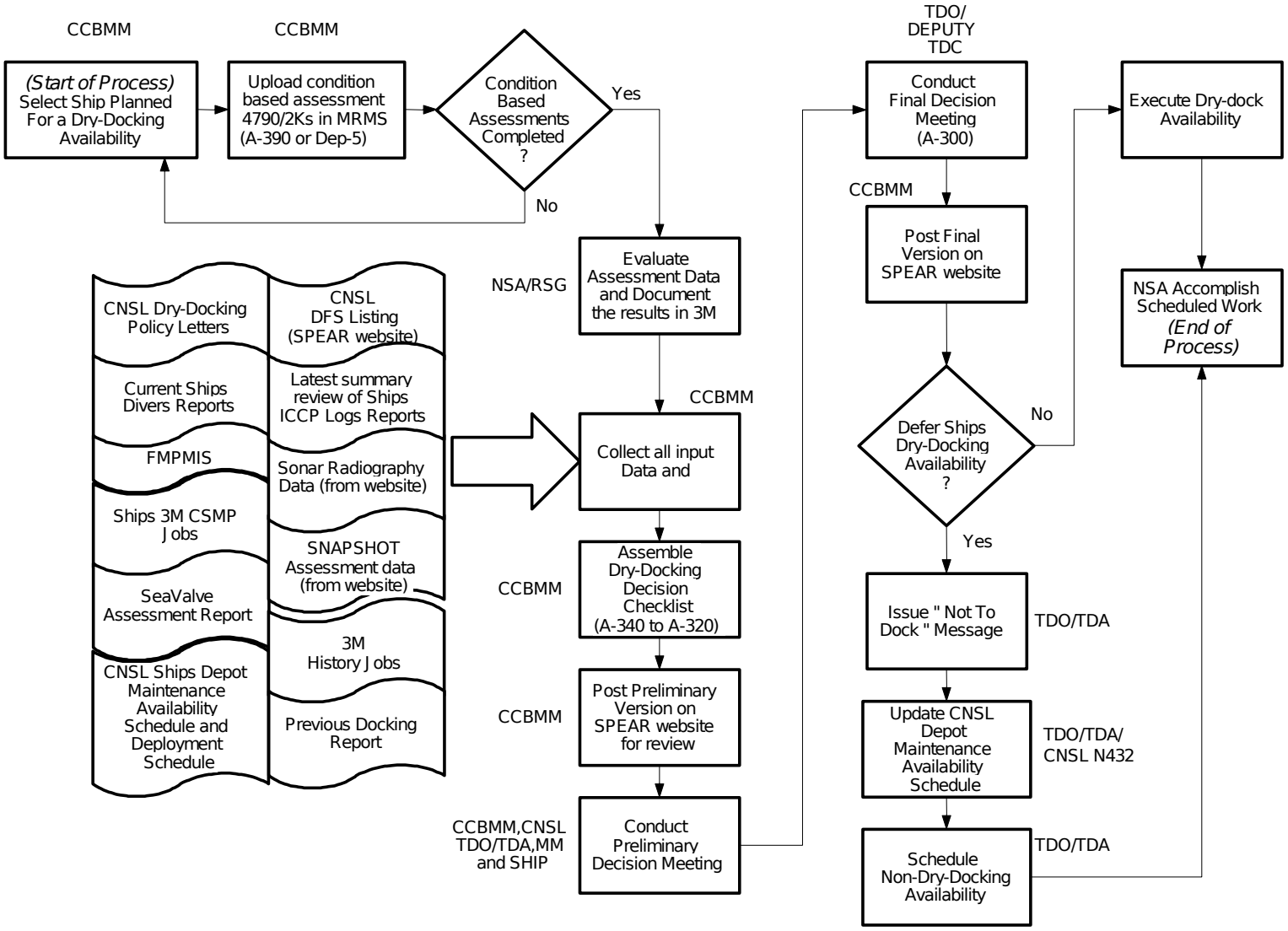
CMIIP ltr Fourteen - dtd 19 Jan 2000 -Drydocking Decision Process

DOCKING DECISION PROCESS
& CHECK OFF LISTS

Typical Milestones

SHIP MAINTENANCE MILESTONES			USS XYZ DD 999 FY: 2002 DPMA			21-Feb-01
Start Date: 05/08/01 Complete Date: 08/29/01	PLACT: TBD		EXACT: TBD		Homeport: NORVA	
P.E.: ISIC: COMDESRON 29	TDO: LCDR Maximum Money		TDA: Ferd Berfel			
Events	**Responsible**	**Target**	**Notional Date**	**Manager's Date**	**Complete Date**	**Comment**
Establish RMAIS/BAIM/AUS CNO CM availabilities	RSG/RMC/PLNG ACT	A-720	5/18/98			
Set up online specification review on www	SPORT/PLNG ACT	A-720	5/18/98			
Conduct design & planning shipchecks (start)	EPY/PLNG ACT	A-720	5/18/98			
Provide Class-F estimates (start/continuous)	PLNG ACT	A-710	5/29/98			
Develop specifications (start/continous)	PLNG ACT	A-710	5/29/98			
Conduct SEMAT I Assessment	CNSL/SHIP	A-630	8/16/98			
Conduct Ventilation Assessment	SPORT	A-630	8/16/98			
Conduct Tank Inspection	SPORT	A-630	8/16/98			
Develop specifications (25%)	PLNG ACT	A-540	11/14/98			
Conduct "D/E/F" alteration review	CNSL TDO	A-540	11/14/98			
NAVSEA Advanced Planning Letter Issued	NAVSEA	A-540	11/14/98			
Provide NAVSEA SHIPALT planning funds	NAVSEA	A-540	11/14/98			
Load Condition-Based Drydocking 2-Kilos	SPORT	A-390	4/13/99			
Provide SHIPALT Drawing Schedule	CNSL/SHIP	A-370	4/13/99			
Conduct SEMAT II Assessment	CNSL/SHIP	A-370	5/3/99			
Issue NAVSEA SHIPALT Authorization Letter	NAVSEA	A-360	5/14/99			
Review K alteration letter	CNSL TDO	A-345	5/28/99			
Conduct mid-cycle maintenance review	CNSL TDO	A-300	7/12/99			
Determine drydocking requirements	CNSL TDO	A-300	7/12/99			
Commence Monthly Planning Status Message	SHAPEC	A-300	7/12/99			
Determine availability type	CNSL TDO	A-285	7/27/99			
Review/load/screen TYCOM routines	MM/SPORT	A-270	8/13/99			
Conduct design & planning shipchecks (end)	EPY/PLNG ACT	A-270	8/13/99			
Conduct CM availability brief	CNSL N432	A-270	8/13/99			
Screen all TA2/3 to CTF-63 (start)	MM/RSG/RMC	A-270	8/13/99			
Review/load/screen non-assessable ICMP	MM/SPORT	A-270	8/13/99			
Review/load/screen D/E/F alterations	CNSL/TDO/SPORT	A-270	8/13/99			
Program D/E/F alterations (complete)	CNSL TDO	A-270	8/13/99			
Ship deploys	SHIP	A-240	9/10/99			
Develop specifications (50%)	PLNG ACT	A-235	9/17/99			
Submit AIT support requirements 2K (start)	AIT	A-180	11/9/99			
Develop specifications (75%)	PLNG ACT	A-180	11/9/99			
Conduct SEMAT III and zone inspection	SPORT/SHIP/MM	A-135	12/24/99			

Drydocking Decision Process



Drydocking Checklist (Summary Sheet)

Component	Page No.	Is Drydocking Required now to correct?		Correct if Ship is Docked?		If Ship is not Docked, What is the Risk?
		Yes	No	Yes	No	
Waster Sleeves						
Propellers (CPP/CRP)						
Main Shafts/Covering						
Alterations						
Departure From Specifications						

Component	Page No.	Is Drydocking Required now to correct?		Correct if Ship is Docked?		If Ship is not Docked, What is the Risk?
		Yes	No	Yes	No	
Underwater Hull Paint						
Freeboard Paint						
Sea Valves						
Cathodic Protection						
Underwater Hull Plating						
Rudders						
Tanks/Voids						
APU/Fin Stabilizers (FFG)						
Masker Air						
Sonar Dome/Trunks						
- Does Docking Deferral and delay of radiography drive sonar dome to no entry						

Reviewed:

Port Engineer _____ Ship's Force Representative _____

CNSL Type Desk Officer _____ CCBMM _____

Drydocking Checklist (Detail Sheets)

Ships undock date: **Docking Report**
Last full hull cleanings: **Diver's report or local dive activity**
Deploys: **TYCOM/ship**
Next Avail: **CNSL Maintenance WEB page (http//www.spear.navy.mil)**
Following Avail Sked **WEB page**

Components/issues	**Status**
Waster Sleeves	
Date installed	Docking Report -
Any replaced since above date	3M OARS
(Maintenance Strategy is to replace waster sleeves smaller than 12" at each docking - and to evaluate those larger than 12" - renewing as needed).	
Propellers	
CPP or fixed	Class Drawings
Last cleaned	Divers Report/3M OARS
Last inspected	Divers Report/3M OARS
Any known damage that requires docking	3M OARS

Results are in the Web!

Available Resources

Drydocking Checklists

- http://www.spear.navy.mil/snapshot/UW/SPAM.HTM

Waterborne Assessments

- http://www.spear.navy.mil/cgi-bin/webdbc.dll/spear/default/htx/&/snapshot/uw/uwmenu1.htx

CMIIP Letters 3 (Policy) and 14 (Process)

- http://www.spear.navy.mil/CMI/CMIIP_P3.html
- http://www.spear.navy.mil/CMI/CMIIP_14.doc

TDO Drydocking Maintenance Guide

- http://www.spear.navy.mil/who/work.htm

Process Pit Falls

- Failure to adhere to process
  - Sea Valves
  - Shaft Work
  - Paint Systems
    - Tanks – Perceived budgetary pressures to defer repairs results in greater costs in the long run (LPDs)
    - Underwater Hull (Type of paint, scope of repair)
- Hull Structure issues
- SHIPALT Installations
- Waster Sleeves
  - Valve Reservations
  - Drawings
- Baseline Data Collection
- Contractor Condition Reports
  - Want to do now and want to use familiar processes
- Failure to take max advantage of emergent dry dockings

COMNAVSURFLANT
Is Meeting the Challenge

- Reduces Life Cycle Costs
  - Meeting Estimated 20% Budget Constraints
- Manages Our Resources Effectively
- Is Proactive - Not Reactive
- Allows CNSL to Continuously Improve By:
  - Taking Variation out of the CBM Process
  - Measuring Effectiveness of Strategies

Acting on Results

Other Studies

- Centrifugal Pumps
- Tank and Void Maintenance Strategy
- Watertight Closure Maintenance Strategy
- Diesel Engine Maintenance and Inspection
- Underwater Hull Structure Maintenance Strategy
- Topside and Freeboard Paint Strategy
- Galley Equipment
- Deck Coverings
- Low and Medium Pressure Air Compressors
- Link to All Studies - http://www.spear.navy.mil/SPAM/SPAM.htm
  - Click on Various Investigations, then to subject of interest

Help/Questions/Feedback

Contact:
SUPSHIP SPaM Office (Code 225)
(757) 396-3996 lyketj@supship.navy.mil

Mr. Tim Lyke (SUPSHIP C225)
Mr. Rudy Norman (Paint, Protrusions, ICCP, Hull Structure)
Mr. Mark Hornick (Sonar, Sea Valves, Waster Sleeves, Sea Chests)
Mr. Greg Starr (Tanks/Voids)

CNSL SPaM Facilitator: pat_fox@amsec.com
Pat Fox (AMSEC) (757) 463-6666

Policy

Policy - Sea Valves

Policy

- Repair or replace non-functional valves as they are identified
- Schedule repair or replacement of functional, leaking non-critical valves
  - Disassemble, clean, blue check before sending to the shop
  - Valves that cannot be repaired in place are to be sent to the shop
- Clean and blue check all other sea valves
  - High pressure washing in drydock of all internals
  - Blue check – shop repair if check fails – static head pressure hydro
- Critical valves shall be repaired or replaced during each docking.
  - Listed by class
  - Cause a C3/C4 CASREP if they fail in the closed position
  - 18” or greater in size
- Repair vs. replacement is a financial decision.
  - 4” for globe and gate valves
  - 6” for butterfly valves

Policy - Sea Chests/Waster Sleeves

Policy

- Replace all waster sleeves at initial CB drydocking to establish baseline
- Inspect and repair waster sleeves as required during future drydocking availabilities
- Increase waster sleeve thickness (3/4” vice 3/8”) for 13” and larger sea chests
  - Also revised min specified thickness for smaller waster sleeves
  - Additional thickness is good for a 12 year service life
  - Plan to replace all waster sleeves smaller than 12” at each docking
- Transition to composite strainer plates after fully tested

Policy - Underwater Hull Paint

Policy

- FTSCLANT evaluate paint system prior to docking decision. Evaluation will include results of:
  - DFT sampling
  - Divers reports
- Trend paint thickness measurements
- Strictly enforce paint system quality requirement in dry dock
- Delete 5 year systems and install 10 year systems except when anticipated decommissioning indicates otherwise
- Track paint system performance

Policy - Cathodic Protection

Policy

- PMS transitioned to FTSCLANT
  - Performed during SEMAT II
- Use automated systems
  - Compatible with ICAS
  - Computer based controllers
  - Install solid state pre-amps in existing controllers
- Use waterborne condition based assessment to support drydocking decision process
- Strictly enforce the QA requirements associated with anode and dielectric shield installation

Policy - Underwater Hull Protrusions

Policy

- Remove shaft only if repairs cannot be completed in place or if the interval since last removal is approaching 12 years
- Modify fairwaters to allow divers to take shaft to stave retainer clearances waterborne to support drydock availability deferral decision process
- Replace bearing staves and repair journal only if clearances exceed NSTM requirements (top) or less than 100 mils (lower) or are projected to exceed either limit prior to the next docking.
- Replace shaft seals with John Crane MX-9 seals as existing seals fail.
- Replace inflatable seals only as condition indicates (FTSCLANT assess)
- Inspect and repair CPP hubs as condition warrants.
- Inspect and repair rudder seals and bearings in dock.
- Develop trending data for wear components to allow strategy

Policy – Sonar Dome

Policy

- Schedule internal dome inspections coincident with radiography (2 - 4 years) or if emergent inspection is required due to an equipment casualty.
- Review and revise periodicity of sonar dome pressurization system PMS.
- Cycle pressurization system valves quarterly.
- Develop waterborne process for FFG 7 sonar dome radiography.
- Develop SDRW radiography process that does not required dome entry.
- Review and revise pressurization system CSOSS, PMS and Tech Manual operating procedures to ensure they are consistent with each other.
- Post sonar dome data on the www.
- Continue current maintenance strategy and periodicities for

Policy - Tanks & Voids

TYPE TANK	CURRENT ICMP PERIODICITY (months)	OLD COATING RECOMMENDED PERIODICITY (months)	SOURCE FOR EXTENDING PERIODICITY	NEW COATING PERIODICITY	NOTES (Coating service life per 03M & manuf.)
BALLAST	61 (D/D)	72*	Age degradation study based on SEMAT data for current paint systems.	120	With adoption of Sigmaguard BT & S/W Duraplate, anticipate service life of 20 years.
CHT	36	48	Previous depot level availabilities were nominally on an 18 month cycle which drove 36 month interval. With extension of availabilities to 24 months, interval should extend to 48 months.	72	Small population in age degradation study – new coatings may extend inspection interval. Edgeguard expected to provide 8 year service life for CHT.
CONTAMINATED	61	120*	Age degradation study from SEMAT data	TBD	Use of Edgeguard proposed but not yet tested.
DFM	61	120*	Age degradation study from SEMAT data	TBD	Use of Edgeguard proposed but not yet tested.
FEED WATER	61	See Potable Water	See Potable Water	See Potable Water	See Potable Water
JP-5	18/36 (service/ storage) per PMS but has been increased to 36/60 per CWP	120* (36/60)	Age degradation study from SEMAT data	120	20 year service life anticipated. (Use of Edgeguard proposed but not yet tested).

nbership did not reach unanimous agreement on periodicity. For JP-5,CWP elected to doubling the periodic

Policy Results - Tanks & Voids

TYPE TANK	CURRENT ICMP PERIODICITY (months)	OLD COATING RECOMMENDED PERIODICITY (months)	SOURCE FOR EXTENDING PERIODICITY	NEW COATING PERIODICITY	NOTES (Coating service life per 03M & manuf.)
LUBE OIL	61	120*	Not covered in age degradation study – extrapolated based on other petroleum products.	120	20 year service life anticipated. Use of Edgeguard proposed but not yet tested.
POTABLE	60	72	NAVSEA (03N) msg 180301Z SEP 98 (quoted in notes) (Note: age degradation data indicates much longer period (8 - 10 years) but current data based on very small population).	120	20 year service life anticipated. CWP 182 – "The next advanced change notice to NSTM 631 (ECD 10/98) will modify required painting of potable water tanks from time based (every overhaul) to conditional (every six years or the nearest availability)." New Coating TBD.
VOIDS – Non-floodable	61	120*	No age degradation data	120	Since voids had little 3M data and no CASREPs – risk considered minimal. Coatings for non-floodable voids same as ballast tanks.
VOIDS – Floodable (FFGs)	61	72	No age degradation data	120	Since voids had little 3M data and no CASREPs – risk considered minimal. Coatings for floodable voids same as ballast tanks.

Policy Results - Tanks & Voids

Policy

- Set new requirement to open T&V based on age exploration of observed tank conditions and time since coated
- Based on repair data and PE inputs, most tanks will be opened sooner:
  - Emergent repairs
  - Sand blasting of hull
  - Hot work in adjacent spaces
- Make steel repairs when deterioration noted – long term costs will be much greater if not done upon discovery
- Preservation protocol on line – repair protocol pending

Recent Policy Change - Tanks & Voids

4700
Ser N432A4/0699
18 June 2001

Subj: ASSESSMENT (VISUAL INSPECTION) OF TANKS AND VOIDS

Ref: (a) COMNAVSURFLANT Continuous Maintenance Implementation/ Improvement Policy Letter 7, 4700 Ser N432A/0454 of 5 Apr 99
(b) COMNAVSURFLANT MSG 022018Z SEP 99
(c) Standard Work Item 992-31 Cleaning and Pumping; Accomplish
(d) Standard Work Item 992-50 SEMAT Assessment Team Support; Provide

1. Reference (a) established COMNAVSURFLANT policy for assessment of steel tanks and voids during CNO availabilities. Reference (b) tasks SUPSHIP Portsmouth (C220) to conduct tank and void assessments during SEMAT I visits when opening of tanks and voids by the contractor is mandated by specification package work requirements.

2. To eliminate duplicate coverage and more efficiently utilize limited maintenance funding, contractor/shipyard visual inspections of steel tanks and voids will no longer be tasked and funded during NAVSURFLANT CNO availabilities. All SHAPEC Planning Activities are to incorporate references (c) and (d) into each NAVSURFLANT CNO availability work specification package. In addition, work items developed for opening of specific steel tanks or voids shall not contain requirements for contractor/shipyard visual inspections of these tanks or voids.

Policy – Hull Structure

Policy

- Internal and external assessments prior to Decision Group
- External assessment of non-assessable “hot spots” using Divers or ROV
- Reduction of hull thickness by 25% of original thickness alerting criteria
- FTSC evaluates thinning – FTSC/NAVSEA consultation as required
- Course of action recommendations and risk assessment based on data